

Exponential Growth 7.6 p425

Exponential Growth

- something is increasing exponentially
- ie. bacteria growth, popcorn popping, amount of \$ in a savings bond

$$P(n) = P_0(1+r)^n$$

$P(n)$ = pop # / Principle Amount \$

$P(0)$ = pop at time 0 / Amount of \$ Deposited Originally

r = r is the growth rate

n = growth periods

ie. 4

A bacteria strain doubles in number every three minutes. If there are 1000 bacteria initially, how many will there be after 0.25h?

$$P(n) = P_0(1+r)^n$$

$$P(n) = ?$$

$$P(0) = 1000$$

$$r = \Rightarrow \text{doubles } (1000) \Rightarrow 1.0$$

$$n = 0.25h \Rightarrow 15 \text{ min} / 3 = 5$$

Double = 1.0
Triple = 2.0

May 14-8:05 AM

May 14-10:21 AM

$$P(n) = P_0(1+r)^n$$

$$P(n) = 1000(1+1)^5$$

$$P(n) = 1000(2)^5$$

$$P(n) = 1000(32)$$

$$P(n) = 32000$$

There is a population of 32,000 bacteria after 0.25h.

The city of Mississauga has experienced rapid growth in recent years. It had a population of 234,975 in 1975 and 610,700 in the year 2000. Determine the annual growth rate of the population between 1975-2000.

$$P(n) = P_0(1+r)^n$$

$$P(n) = 610,700$$

$$P(0) = 234,975$$

$$r = ? \%$$

$$n = 25 \text{ years}$$

May 14-10:25 AM

May 14-10:25 AM

$$P(n) = P_0(1+r)^n$$

$$610,700 = 234,975(1+r)^{25}$$

$$\frac{610,700}{234,975} = (1+r)^{25}$$

$$2.60 = (1+r)^{25}$$

$$\sqrt[25]{2.60} = 1+r$$

$$1.04 = 1+r$$

$$1.04 - 1 = r$$

$$0.04 = r$$

$$4\% = r$$

The city grows at an annual growth rate of 4% over 1975-2000.

$$\sqrt[25]{2.60} = 1.04$$

May 14-10:37 AM

8. Mari invests \$2000 in a bond that pays 6% per year.
- Write an equation that models the growth of her investment.
 - How much money does she have if she cashes the bond at the end of the 4th year?
 - How much will the bond be worth at the end of the 5th year? How can you determine the amount earned during the 4th year?
 - Determine the amounts Mari will earn at the end of the 20th and 21st years to find the amount earned during the 20th year.
 - Compare the money earned in the 4th and 20th years. What does this tell you about exponential growth?

Dec 6-8:57 AM

⑨ p431

$$P(n) = P_0(1+r)^n$$

$$P(0) = 2000$$

$$r = 0.06$$

$$n = 4$$

$$P(n) = 2000(1+0.06)^4$$

$$P(n) = 2000(1.06)^4$$

$$P(n) = 2000(1.26)$$

$$P(n) = 2524.95$$

She has earned 524.95 in 4 years

$$P(n) = 2000(1+0.06)^5$$

$$P(n) = 2000(1.06)^5$$

$$P(n) = 2000(1.34)$$

$$P(n) = 2680.00$$

$$2680.00 - 2524.95 = 155.04$$

year 20 and year 21

$$6414.26 - 6299.12 = 384.86$$

The longer you leave money in to earn interest the more double the growth. Compounds - the money that is earned works to make more money for the next year

May 14-10:46 AM

$$P(n) = P_0(1+r)^n$$

After 20 years

$$= 2000(1+0.06)^{20}$$

$$= 2000(1.06)^{20}$$

$$= 2000(3.21)$$

$$= 6414.27$$

She has earned 4414.27 over the 20 years on her investment

May 14-10:51 AM

p421-432

a 2, 3, 4, 7, 10, 11, 12

May 14-10:55 AM

⑪ $P(n) = P_0(1+r)^n$

$$P(n) =$$

$$P(0) = 4$$

$$r = 200\% \text{ (triples)} \therefore 2.0$$

$$n = 20 \quad 300\%_{15} = 20$$

$$P(n) = 4(1+2)^{20}$$

$$P(n) = 4(3)^{20}$$

$$P(n) = 4(3486784401)$$

$$P(n) = 1.39 \times 10^{10}$$

May 25-10:27 AM

Apr 29-10:17 AM